Chapter 6

ABM Treaty Compliance

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6.1 Introduction

The 1972 Anti-Ballistic Missile (ABM) Treaty addresses the development, testing, and deployment of ABM systems and components. It should be noted that use of the word "research" does not appear in the ABM Treaty and research is not constrained by the Treaty. Neither the United States nor the Soviet delegation to the Strategic Arms Limitation Talks (SALT I) negotiations chose to place limitations on research, and the ABM Treaty makes no attempt to do so. The United States has traditionally distinguished "research" from "development" as outlined by then-U.S. delegate Dr. Harold Brown in a 1971 statement to the Soviet SALT I delegation. Research includes, but is not limited to, concept design and laboratory testing. Development follows research and precedes full-scale testing of systems and components designed for actual deployment. Development of a weapon system is usually associated with the construction and field testing of one or more prototypes of the system or its major components. However, the construction of a prototype cannot necessarily be verified by national technical means of verification. Therefore, in large part because of these verification difficulties, the ABM Treaty prohibition on the development of sea-based, air-based, space-based, and mobile land-based ABM systems, or components for such systems, applies when a prototype of such a system or its components enters the field testing stage.

6.2 Existing Compliance Process for BMDO

The Department of Defense (DoD) has in place an effective compliance process (established with the SALT I agreement in 1972) under which key offices in DoD are responsible for overseeing BMD compliance with all the United States arms control commitments. Under this process, the Ballistic Missile Defense Organization (BMDO) and DoD components ensure that the implementing program offices adhere to DoD compliance directives and seek guidance from offices charged with oversight responsibility.

Specific responsibilities are assigned by DoD Directive 2060.1, July 31, 1992, "Implementation of, and Compliance With, Arms Control Agreements." The Under Secretary of Defense (Acquisition & Technology) (USD(A&T)), ensures that all DoD programs are in compliance with the United States arms control obligations. The Service Secretaries, the Chairman of the Joint Chiefs of Staff, and agency directors ensure the internal compliance of their respective organizations. The DoD General Counsel provides advice and assistance with respect to the implementation of the compliance process and interpretation of arms control agreements.

DoD Directive 2060.1 establishes procedures for ensuring the continued compliance of all DoD programs with existing arms control agreements. Under these procedures, questions of applicability of specific agreements are to be referred to the USD(A&T) for resolution on a case-by-case basis. No project or program which reasonably raises a compliance issue can enter into the testing, prototype construction, or deployment phase without prior clearance from the USD(A&T). If

such a compliance issue is in doubt, USD(A&T) approval is sought. In consultation with the office of the DoD General Counsel, Office of the Under Secretary of Defense (Policy), and the Joint Staff, USD(A&T) applies the provisions of the agreements as appropriate. DoD components, including BMDO, have established internal procedures and offices to monitor and ensure internal compliance and periodically certify internal compliance to the Office of the Secretary of Defense.

In 1985, the United States began discussions with allied governments regarding technical cooperation on BMD research. To date, the United States has concluded bilateral BMD research Memoranda of Understanding (MOU) with the United Kingdom, Germany, Israel, Italy, and Japan. All such agreements will be implemented consistent with the United States' international obligations including the ABM Treaty. The United States has established guidelines to ensure that all exchanges of data and research activities are conducted in full compliance with the ABM Treaty obligations not to transfer to other states ABM systems or components limited by the Treaty, nor to provide technical descriptions or blueprints specially worked out for the construction of such systems or components.

6.3 BMDO Experiments

All BMDO field tests reasonably raising treaty compliance issues must be approved for treaty compliance determinations through the DoD compliance review process. The following major programs and experiments, all of which involve field testing, have been approved and either were conducted during FY 1996 or will be conducted during FY 1997: flights in the Airborne Surveillance Testbed (AST) program, a revision of the Airborne Optical Adjunct (AOA) project; High Altitude Balloon Experiments (HABE); the Midcourse Space Experiment (MSX); AEGIS SPY-1 radar and Standard Missile (SM-2 Block IV) modifications (Navy Area Defense Program); HAWK and TPS-59 radar upgrades; Miniature Sensor Technology Integration (MSTI) Satellite Development Program MSTI-3; PATRIOT PAC-3/ERINT system EMD flight tests; Theater High Altitude Area Defense (THAAD) interceptor Program Definition/Risk Reduction (PD/RR) flight tests 7-11; Endoatmospheric Aerothermal Mechanics Flight Test Experiments (EFEX); Resident Space Objects Rehearsal; Space Technology Research Vehicle 2 Mission (STRV-2) (FY 1998); Stinger With Optimized Radar Distribution (SWORD) program; Space and Missile Tracking System (SMTS) (formerly Brilliant Eyes) Flight Demonstration System (FDS) (FY 1998-99) and THAAD User Operational Evaluation System (UOES) System and Engineering and Manufacturing Development (EMD) program (includes interceptor and Theater Missile Defense-Ground Based Radar (TMD-GBR)); Cape Cod PAVE PAWS Doppler Discrimination Experiment; and National Missile Defense (NMD) Development Readiness Program Integrated Flight Tests 1-2 (Involving Exoatmospheric Kill Vehicle (EKV) Sensor Flight Tests). Compliance guidance has been provided for the Israeli Arrow interceptor development program known as the Arrow Continuation Experiments (ACES).

In addition, the following data collection activities are approved: High Altitude Observatory (HALO) aircraft; Cobra Judy; Theater Missile Defense Critical Measurements Program (TCMP) II (FY 1997) and III (FY 1998); Russian-American Observation System (RAMOS); Countermeasures Skunkworks Mission flight-tests 7-10; Active Geophysical Rocket Experiment (AGRE);

Glory Trip 160 and 162 Target of Opportunity checkout tests; Glory Trip 21 rehearsal; Glory Trip 22 PA; Red Tigress III; TMD SITs 96-1A, 96-1B, and 97-1, and the TMD C^3 program.

The following projects are approved activities that are not considered to be in field testing: Alpha/LAMP Integration (ALI) and the High Energy Laser System Test Facility (HELSTF) experiments and data collection activities. Also, the Joint National Test Bed (JNTB) including the Experiment Control Center (ECC) has been determined to be compliant with the ABM Treaty.

The following target development projects have been approved: Multi-Service Launch System (MSLS); Strategic Target Systems (STARS); Storm Targets (STORM II/Maneuvering Tactical Target Vehicle (MTTV)); Hera Target Vehicle; and the short-range Air Drop Target. All BMDO launches are reviewed for compliance with the research and development launch provisions of the 1987 Intermediate-Range Nuclear Forces Treaty. The Nuclear Risk Reduction Center of the Former Soviet Union (FSU) will be notified of such launches, as required.

Changes to the above approved experiments and programs are required to be reviewed for compliance implications.

The following programs, some of which have not been sufficiently defined for compliance certification, have not yet been determined to be treaty compliant: Medium Extended Air Defense System (MEADS) (also known as the Corps Surface to Air Missile (Corps SAM)); Airborne Laser Program (ABL); Exoatmospheric Kill Vehicle (EKV) flight tests (FY 1998-2000) (formerly the Ground Based Interceptor); Ground Based Radar Prototype (GBR-P) RTD program and the Long-range Air Launch Target.

The NMD deployment readiness program will be conducted in compliance with the ABM Treaty. Depending on its configuration, a deployed NMD system could either be compliant with the ABM Treaty as written, or might require amendment of the treaty's provisions.

Chapter 7

International Coordination And Consultation

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7.1 Introduction

As a result of past participation in Theater Missile Defense (TMD) programs, global proliferation of ballistic missiles, lessons-learned from the Gulf War, and allied politico-military consultations and discussions, there is greater recognition among our friends and allies of the existing and emerging threat of ballistic missile attack and the need for the development of effective missile defense systems. Multilateral studies and activities in the North Atlantic Treaty Organization (NATO) Alliance and in unilateral actions by individual nations demonstrate the increased commitments to TMD.

7.2 Allied Consultations and Participation in Ballistic Missile Defense Programs

The Department of Defense approach to international participation in the development and deployment of TMD systems continues to build upon consultations with our allies and the establishment of bilateral and multilateral Research and Development (R&D) programs. Over the past ten years, our allies have contributed over $250 million through cooperative programs which are directly related to the U.S. Ballistic Missile Defense (BMD) program, including Theater Missile Defense (TMD). These cooperative R&D programs not only brought highly advanced technologies from abroad, but they also provided our allies with added insights with which to make informed decisions regarding their own missile defense requirements. The United Kingdom (U.K.) and Japan are currently involved in studies to determine their national BMD requirements and policy.

In an effort to achieve economies in the use of national resources and improving point defense of vital assets and maneuver forces, Germany, Italy, and the United States have agreed to cooperate on the joint development of the Medium Extended Air Defense System (MEADS). The codevelopment program, which was agreed for inclusion in the NATO structure, will be based on a commonly agreed military requirement, and to the maximum extent will capitalize upon technology existing in the participant nations. A Memorandum of Understanding (MOU) covering the Project Definition/Validation (PD/V) phase of the program was signed in May 1996. When fielded, MEADS will provide the three nations, and potentially other NATO nations, with a highly transportable, low-to-medium altitude, air and missile defense system against a variety of tactical missile and air breathing threats.

Consistent with Congressional urging, the United States has taken the initiative within NATO to forge an Alliance-wide consensus on the need for ballistic missile defenses -- defenses that contribute significantly to Alliance efforts to deter and defend against the proliferation of weapons of mass destruction and their associated delivery systems. Several NATO bodies are engaged in complementary TMD activities including, inter alia, development of a policy framework, Military Operational Requirement (MOR), Extended Air Defense Conceptual Framework, and approaches

and mechanisms for defining opportunities and methods of cooperation and/or collaboration in the TMD area. This latter area falls under the responsibilities of the Conference of National Armaments Directors (CNAD) which has established two NATO ad hoc groups. The first group explored opportunities for cooperation in the development and deployment of theater missile defenses whereas the follow-on ad hoc group focuses on Battle Management/Command, Control, and Communications (BM/C^3) and the development of technical systems configurations and associated costs.

7.3 Selective Status of Nations and NATO

7.3.1 United Kingdom (U.K.)

Since 1985, the United States has been actively involved with the U.K. on a variety of mutually beneficial BMD data exchanges, scientist and engineer exchanges, joint studies, trials, and experiments under an overarching MOU. The U.S. and U.K. are presently involved in a cooperative technology demonstration program involving the U.K. Multifunction Electronically Scanned Aperture Radar (MESAR) and early warning system experiments. The U.K. investments in these and similar programs, studies, and trials for over ten years now, have led to a strong relationship with the U.K. defense establishment and industry on BMD issues.

In addition to their long-term support of our cooperative activities in BMD R&D, the U.K. has concluded a 14-month Pre-Feasibility Study (PFS) to determine its national BMD requirements, including protection of its military forces abroad. The PFS and its associated studies have been presented in a report to ministers, and a policy decision regarding BMD systems development will be forthcoming.

7.3.2 Germany

The United States and Germany have long enjoyed a close, cooperative relationship in air defense activities since 1989. This relationship is being further advanced through cooperative efforts in TMD. In addition to its participation in the MEADS program, Germany is proceeding toward PATRIOT PAC-3 upgrades through Configuration 3. The United States and Germany have an ongoing cooperative program to enhance interoperability between their respective air defense tactical operations centers and in July 1996 entered into an agreement to conduct joint test bed experiments and analyses.

7.3.3 France

As a result of the 1994 Defense Ministry White Paper, France initiated an aggressive five year technology development program in BMD to be carried out indigenously and in cooperation with other NATO nations. Although the French government was not prepared to make a financial committment to MEADS, France has shown interest in participating with the United States in other areas such as early warning, Battle Management/Command, Control, and Communications (BM/C^3), phenomenology research, and extended air defense simulation modeling.

7.3.4 Italy

Italy is but one of a few NATO countries currently within range of North African tactical ballistic

missiles. Italy's vulnerability to ballistic missile attack was underscored by Libya's Scud missile attack against the Italian island of Lampudusa in the 1980s. The incident provided Italy the impetus for exploring replacement of its I-HAWK weapon systems, which culminated in Italy joining the United States and Germany in the MEADS codevelopment program. The Italian Ministry of Defense (MoD) is currently working on a comprehensive plan for air and missile defense that addresses both the threat and proposed architectures.

7.3.5 The Netherlands

The Netherlands has been a particularly active participant in NATO's extended air defense improvement efforts. It is studying requirements with a view toward possible purchase of PAC-3 for its operational PATRIOT systems and is in the process of acquiring the U.S. Extended Air Defense Simulation (EADSIM) modeling tool. The Netherlands has also expressed interest in the Navy's planned Standard Missile Block-IVA developments for inclusion in their next generation air defense Frigate 2000.

7.3.6 NATO

NATO's policy supporting an Alliance TMD capability is steadily developing. It began in the early 1990s with an appreciation of the risks posed to the Alliance by the proliferation of Weapons of Mass Destruction (WMD) and their delivery means among rogue nations to the south and east of NATO's periphery. NATO's new Strategic Concept recognized the necessity for protecting NATO's deployed military forces, territory, and population against ballistic missiles with WMD. An integrated NATO concept for extended air defense encompasses the need to defend against combined threats consisting of air breathing vehicles, tactical aerodynamic missiles, and ballistic missiles, and an MOR for Active Theater Ballistic Missile Defense has been prepared by NATO's major commands (Supreme Allied Command, Europe (SACEUR) and Supreme Allied Command, Atlantic (SACLANT)). More recently, NATO Defense Ministers have endorsed the Senior Defense Group on Proliferation (DGP) Phase I Report, which found that extended air defense, including Tactical Ballistic Missile (TBM) defense, was an essential component of NATO's response to the proliferation risk, and that the CNAD should develop options for pursuing a layered defense for NATO's deployed forces and report back to the North Atlantic Council.

The CNAD established an Extended Air Defense/Theater Missile Defense Ad Hoc Working Group (EAD/TMD AHWG) in 1993, composed of interested nations with resources to contribute, to examine mechanisms and opportunities for cooperation on ballistic missile defense. This group completed its work in 1995 and submitted its report that identified 19 possible areas for cooperation in TMD, provided an initial plan for proceeding with sensor, weapon, and BM/C^3 activities and, finally, recommended a follow-on group be established to (1) specifically examine requirements and ways to cooperate/collaborate on missile defense BM/C^3 and (2) develop technical systems configurations for TMD including associated costs. The CNAD endorsed these recommendations and a Missile Defense Ad Hoc Group (MDAHG) was established. The MDAHG, composed of 14 nations, has been given two principal remits: (1) provide an initial focus on TMD BM/C^3 for the CNAD, and (2) develop a range of technical configurations and associated cost estimates to inform NATO's Senior DGP who have the task to identify Alliance counterproliferation shortfalls, including TMD, and who will recommend approaches to the North Atlantic Council on how to address these shortfalls.

7.3.7 Israel

Israel has been actively involved in cooperative missile defense programs with BMDO since 1987. Because of the rapidly paced ballistic missile threat in the region, Israel was the first allied nation to declare its intent to field a missile defense system as a national priority. Cooperative activities have included: architecture studies; participation in several technology experiments; test bed development, enhancements, and experiments; examination of boost phase intercept concepts; and the development of the Arrow interceptor. The ongoing Arrow Continuation Experiments (ACES) began in July 1991. With the successful intercept of a target missile in June 1994, and validation of the preprototype design, the Arrow program progressed into the development and testing of the downsized, two-stage Arrow 2. The first flight test of the Arrow 2 on July 30, 1995, successfully demonstrated the interceptor's propulsion system and aerodynamic controls. The second flight test on February 20, 1996, successfully demonstrated the Arrow 2's focal plane array and booster motor. Its first intercept flight test on August 20, 1996, resulted in a successful intercept of a target missile. Three more tests of the Arrow II design are planned for the remainder of the ACES Program, which is planned for completion in 1997.

In parallel with the cooperative ACES program, Israel pursued development of the Arrow Fire Control Radar, Launch Control Center, and Fire Control Center with its own funding. Because of the progress in these Israeli programs and the anticipated success of the cooperative ACES program, Israel committed to the near term deployment of an active theater missile defense system. The Department of Defense (DoD) and Israeli Ministry of Defense (IMoD) negotiated and on March 29, 1996, signed the Arrow Deployability Program (ADP) agreement.

The ADP agreement provides for the integration, test, and evaluation of the Arrow Weapon System (AWS), namely, the jointly developed Arrow interceptor and Israeli-developed Fire Control Radar, Launch Control Center, and Fire Control Center. An interface will be developed for interoperability between the AWS and U.S. theater missile defense systems. Lethality, kill assessment, and producibility will also be jointly examined.

BMDO and IMoD are discussing a follow-on study to a joint boost phase intercept study that was completed in January 1996. The follow-on study would further the boost phase intercept concept developed by Israel and provide the United States unique data for analyses, lessons- learned, and technology risk mitigation.

7.3.8 Japan

Regional activity in response to the threat from tactical ballistic missiles, highlighted by the ongoing North Korean missile program and last year’s increased China-Taiwan tensions, have heightened Japanese public and official awareness of TMD issues. Reflecting this awareness, the U.S.-Japan Bilateral Study on Ballistic Missile Defense, currently scheduled to be completed by summer 1997, will help support a decision by Japan on TMD. To support the study, the United States provides defense system performance and threat information to Japan to assist it in making an informed decision. Additionally, the overarching U.S.-Japan TMD Working Group continues meetings aimed at sharing information on general TMD issues.

Other significant TMD-related issues center on the continued Japanese licensed production and

deployment of the upgraded version of PATRIOT (PAC-2) and the recent commissioning of the third of four programmed AEGIS class destroyers. Additionally, Boeing Aircraft Corporation is currently producing E-767 Airborne Warning and Control System (AWACS) aircraft to be provided to Japan via the Foreign Military Sales Program.

7.3.9 Australia

Australia and the United States have established a modest program of cooperation that focuses on activities which reflect common interests in preventing the proliferation of weapons of mass destruction and affording protection from missile attack. As a result of the March 1994 U.S.-Australia Ministerial talks and the 1994 Australian Defense White Paper, a cooperative project involving sensor/data fusion testing was conducted at the Woomera Missile Range in October 1995. A more expansive experiment is scheduled for September 1997.

7.3.10 Russia

BMDO is involved in a number of technology cooperation projects with Russia. Several programs and experiments are planned or underway. The Russian-American Observational Satellite (RAMOS) program is a potential future joint project which will use both U.S. and Russian sensor platforms and sensors for stereo imaging. The joint Active Geophysical Rocket Experiment (AGRE) program - another project with Russia - investigated the effects of an explosive plasma jet on the ionosphere and evaluated vehicle environmental interactions. Several other small-scale basic and applied research programs with Russia are currently being sponsored by BMDO.

7.3.11 Central and East Europe

BMDO is exploring opportunities for joint projects on technological research and cooperation with several countries in Central and East Europe. Dialogue, and in some cases, specific small projects, have been started with the Czech Republic and Poland.

7.4 Summary

Allied participation in the CNAD MDAHG, MEADS, national studies, and other areas of TMD cooperation reflect the growing concern within the international community regarding the proliferation of ballistic missiles and WMD, and a willingness to address real and perceived limitations to national defense planning and capabilities. Continued allied participation and cooperation in the U.S. BMD program provides the framework for developing and deploying affordable, effective and interoperable TMD systems.

Chapter 8

Ballistic Missile Defense Countermeasures

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Chapter 8
Ballistic Missile Defense Countermeasures

8.1 Introduction

Changes in adversary countries' current operational employment of ballistic missiles in reaction to United States ballistic missile defense have been a critical consideration in developing ballistic missile defense strategy since the early days of the Strategic Defense Initiative (SDI) program. Public Law 99-145, Section 222 (dated November 8, 1985) states "A strategic defense system development, test, and evaluation conducted on the Strategic Defense Initiative Program may not be deployed in whole or in part unless the President determines and certifies to Congress in writing that - (A) the system is survivable (that is, the system is able to maintain a sufficient degree of effectiveness to fulfill its mission, even in the face of determined attacks against it)" and "(B) the system is cost effective at the margin to the extent that the system is able to maintain its effectiveness against the offense at less cost than it would take to develop offensive countermeasures and proliferate ballistic missiles necessary to overcome it;...", To address these concerns, the BMD program has within its organizational structure a Countermeasure Integration Program (CMIP). The CMIP mission is to provide a systems engineering approach to help identify risk associated with the reactive threat and to help BMD system designers develop options for managing risk associated with potential threat excursions outside their design space. This process is known as the Threat Risk Assessment Process (TRAP).

TRAP is a cooperative systems engineering process conducted jointly by the "Blue" system developers and the BMDO "Red" team of reactive threat experts. The TRAP is a rigorous and detailed process to identify potential design susceptibilities and then examine if those susceptibilities could be easily exploited by Rest-of-World (ROW) countries. The process then attempts to evaluate the likelihood of the exploitation concepts and thus assess the threat risk to the system being examined. The BMDO leadership can then develop risk management options which might range from accepting the risk to changing the system design.

The BMDO scope of missions has changed to include TMD, NMD, and Cruise Missile Defense (CMD). The CMIP focus has changed along with this expansion of mission from characterizing countermeasures to being prepared to assess the threat risk associated with any of these programs.

8.2 Theater Missile Defense

Since 1991, the BMD countermeasures program has concentrated on characterizing and analyzing the potential countermeasures available to ROW countries and the effect of these countermeasures on TMD systems. BMDO completed four extensive analyses (Red-Blue Exchanges) of the effect of potential ROW countermeasures on TMD systems. These Red-Blue Exchanges investigated and analyzed potential countermeasures. The Red-Blue Exchanges analyzed the impact of some countermeasures upon the effectiveness of the BM/C^3 architecture, THAAD, PATRIOT PAC-3, MEADS, AEGIS SM-2 Block IVA (both upper- and lower-tier), and Arrow. The CMIP is currently refining the TRA process to meet the needs of the TMD systems engineer.

The CMIP developed and continues to utilize an innovative method of assessing the difficulty for a ROW-like country to develp, build, and deploy countermeasures. This project, known as the Countermeasures Hands On Program (CHOP), uses a small team of junior engineers to design, fabricate, assemble, and ground or flight test BMD countermeasures in a simulated ROW environment. This information is utilized in the TRA process to resolve issues which are derived from the process. Answering the "difficulty" question is extremely important in trying to determine the "likelihood" of a reactive threat concept and thus assessing the risk to a system.

In summary, BMDO has diligently investigated the technical feasibility and difficulty of ROW countermeasures and their effect upon TMD system performance. This information is shared with the TMD system developers and intelligence community to prevent surprises and prepare for possible indicators of ROW reactive threat development. This countermeasures work supports the TMD systems engineering process and the threat risk management strategy.

8.3 National Missile Defense

BMDO completed a Red-Blue Exchange on the NMD First Site System in FY 1994. The Red Team analyzed the susceptibility of the NMD system and devised technologically feasible countermeasures from potential adversaries. As with the TMD system, the CMIP is currently refining the TRA process to meet the needs of the NMD systems engineer. Specifically, the TRA process will be utilized to help the NMD systems engineer define the "design-to-threat" that should be used in the design process.

The Countermeasures Program is currently working on a flight experiment, code named "Red Crow," which will help to characterize and evaluate potential NMD countermeasures. The test is currently scheduled to be conducted in FY 1998.

8.4 Cruise Missile Defense

Cruise Missile Defense is in its infancy in BMDO and therefore the CMIP has not conducted any past Red/Blue exercises or analysis in this area. However, the TRA process is very adaptive to help assess the cruise missile threat, particularly when the system description becomes clearer. The Air Force views CMD as part of its Air Defense Mission, and will work closely with BMDO to develop a CMD capability.